



Field Demonstration of Nanotube Epoxy Paints

Problem

Coatings are the first line of defense for the corrosion protection of civil works steel structures. These coatings must be durable in a wide range of service environments, from mild atmospheric exposure to immersion in turbulent, debris-laden waters. The Corps relies on zinc-rich primers for inhibiting corrosion at any defect in or inevitable damage to the coating system. Zinc-rich primers are heavily loaded with zinc pigment so that many of the zinc particles are in contact with each other, forming a network of sacrificial anodic particles that prevent the corrosion of steel. This heavy pigment loading provides corrosion protection, but coating adhesion, impact resistance, and flexibility are sacrificed. Epoxy coatings form an excellent, durable barrier to the oxygen and water required for corrosion at the steel surface, but epoxies, especially zinc-rich epoxy primers, are known to be brittle and have limited durability in areas of abrasion and impact.



Approach

An innovative primer for corrosion control of steel has been successfully demonstrated on the exterior surfaces of a fuel tank at Fort Bragg, and a potable water tank at Ft. Lewis. Carbon nanotubes replace a portion of the zinc in a zinc-rich epoxy primer formulation. Via the electrically conductive nanotubes, the zinc particles remain in electrical contact, and the coating retains its corrosion-inhibiting properties with improvements in adhesion, impact resistance, and flexibility. The improved performance of the coating will extend the service life and provide life-cycle cost savings.

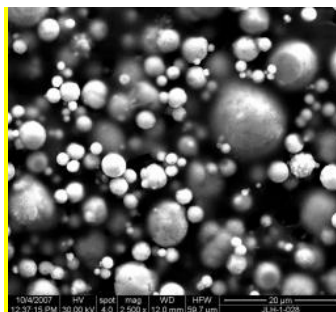
Products

A specification for the coating system will be added to UFGS 09 07 02

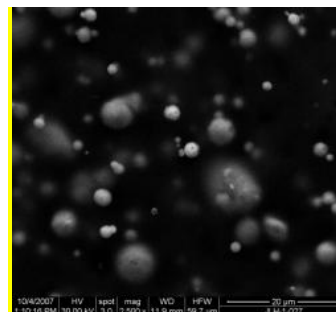
PAINTING: HYDRAULIC STRUCTURES to allow the coating system to be specified for use on new and existing steel structures.

Requirements for surface preparation, mixing and thinning, coating application and curing will be detailed so

the coating system can be properly selected and specified in painting contracts.



Zinc Loading in a Traditional Zinc-Rich Primer



Zinc Loading in Tesla™ Nanotube Epoxy Primer

Benefits

Those responsible for the design and/or maintenance of steel structures will have a new coating system to provide the needed corrosion protection in atmospheric, fresh water, and marine exposures. Compared to traditional epoxy coating systems that employ a zinc-rich epoxy primer, the nanotube epoxy paint system will have greater adhesion and durability, and will provide corrosion protection equal to or surpassing traditional zinc-rich epoxy primers.

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